

H-493

THE

HICKOK

ELECTRICAL
INSTRUMENT
COMPANY

**OPERATING INSTRUCTIONS
FOR
CATHODE RAY OSCILLOSCOPE
MODEL 387R**

**CHOICE OF THE EXPERTS
FOR SPEED, ACCURACY
and DEPENDABILITY...**

STANDARD RETMA GUARANTEE

The Hickok Electrical Instrument Company warrants instruments manufactured by it to be free from defective material or factory workmanship and agrees to repair such instruments which, under normal use and service, disclose the defect to be the fault of our manufacturing. Our obligation under this warranty is limited to repairing any instrument or test equipment which proves to be defective, when returned to us transportation prepaid, within 90 days from the date of original purchase, and provided the serial number has been made known to us promptly for our records.

This warranty does not apply to any of our products which have been repaired or altered by unauthorized persons or service stations in any way so as, in our judgment, to injure their stability or reliability, or which have been subject to misuse, negligence, or accident, or which have had the serial number altered effaced or removed. Neither does this warranty apply to any of our products which have been connected installed, or adjusted otherwise than in accordance with the instructions furnished by us. Accessories, including all vacuum tubes not of our manufacture, used with this product are not covered by this warranty.

This warranty is in lieu of all other warranties expressed or implied and no representative or person is authorized to assume for us any other liability in connection with the sale of our products.

Parts will be made available for a minimum period of five years after the manufacture of this equipment has been discontinued. Parts include all materials, charts, instructions, diagrams, accessories, etc., which have been furnished in the standard model.

RETURNING EQUIPMENT FOR REPAIR

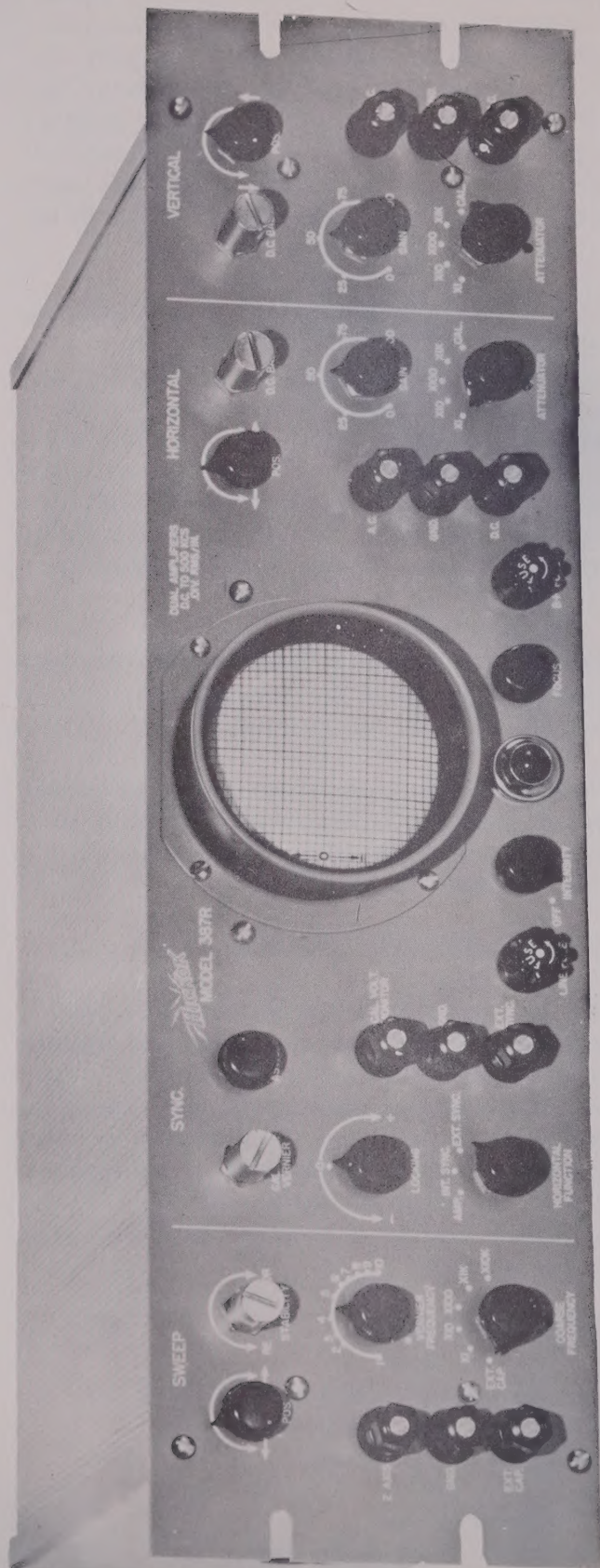
Before returning any equipment for service, under warranty or otherwise, the factory must first be contacted giving the nature of the trouble. Instructions will then be given for either correcting the trouble or returning the equipment. Upon authorization, this equipment should be forwarded directly to the Hickok factory address, 10636 Leuer Avenue, Cleveland, Ohio, or to a designated service station in your locality. All correspondence pertaining to repairs should be directed to the Hickok office address, 10514 Dupont Avenue, Cleveland 8, Ohio, or to the authorized service station designated.

REGISTRATION CARD

The above guarantee is contingent upon the attached registration card being returned to the factory immediately upon receipt of the equipment.

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The Hickok Electrical Instrument Company
Cleveland, Ohio



CATHODE RAY OSCILLOSCOPE

MODEL 387R

SECTION 1

TECHNICAL DATA

EQUIPMENT SUPPLIED (One Complete Unit)

QUAN.	NAME	STYLE	STOCK NO.	DIMENSIONS	WEIGHT
1	Oscilloscope	387R	902-278	5 $\frac{1}{4}$ " x 19" x 11 $\frac{1}{4}$ "	23 lbs.
1	Instruction Book		2490-300	8 $\frac{1}{2}$ " x 11"	
1	Lead Ass'y, Black #18 wire terminated on one end with spade lug and terminated on the other end with a black alligator clip.		12450-225	48"	
1	Lead Ass'y, Red #18 wire terminated on one end with spade lug and terminated on the other end with a red alligator clip.		12450-253	48"	

TECHNICAL CHARACTERISTICS

1.1 POWER SUPPLY REQUIRED:

- (a) Voltage: 115V $\pm$ 10%.
- (b) Frequency: 50 to 400 c. p. s.
- (c) Power Consumption: 65 watts at 115 volts.
- (d) Primary fuse: 3/4 amp. Slo-Blo.
- (e) Secondary fuse: 1/8 amp. Slo-Blo.

1.2 DEFLECTION SENSITIVITY:

- (a) Vertical amplifier: 0.010 volts RMS/inch.
- (b) Horizontal amplifier: 0.015 volts RMS/inch.

1.3 INPUT IMPEDANCE:

- (a) Vertical amplifier: 1 meg. 50 mmf.
- (b) Horizontal amplifier: 1 meg. 50 mmf.
- (c) Z axis: 1 meg.
- (d) Ext. sync: 0.22 meg.

1.4 MAXIMUM INPUT VOLTAGES:

- (a) Vertical input: A. C. 500 volts peak
- (b) Horizontal input: A. C. 500 volts peak
- (c) Z axis: Max. input voltage - 500 volts peak.
- (d) Ext. sync: Max. input voltage - 500 volts peak.

1.5 FREQUENCY RANGE:

(a) Vertical amplifier:

- (1) Frequency response: D. C. to 500KC (within 3db)
- (2) Attenuator: Frequency compensated decade steps of 1 to 1, 10 to 1, 100 to 1, and 1000 to 1.
- (3) Gain control: Non-frequency discriminating 10 to 1 gain control.

(b) Horizontal amplifier:

- (1) Frequency response: DC to 500KC (within 3 db)
- (2) Attenuator: Frequency compensated decade steps of 1 to 1, 10 to 1, 100 to 1, and 1000 to 1.
- (3) Gain control: Frequency compensated 10 to 1 gain control.

1.6 TIME BASE GENERATOR:

- (a) Frequency, recurrent: Frequency coverage from 1 c. p. s. to 100 KC in five calibrated decade ranges with vernier control of 1 to 10 as follows:

1 c. p. s. to 10 c. p. s.
10 c. p. s. to 100 c. p. s.
100 c. p. s. to 1 KC
1 KC to 10 KC
10 KC to 100 KC

Lower frequencies available with use of Ext. Cap. Post.

- (b) Time base expansion: Time base expansion of three times full screen (9 in.) with complete positioning of expanded trace.
- (c) Writing speed, driven: The wide frequency coverage together with expansion will produce writing speeds variable from 500,000 microseconds per inch (based on 2 inches) or 200,000 microseconds per CM (based on 5 CM) to one microsecond per inch (based on 10 inches) or .4 microseconds per CM (based on 25 CM).

1.7 VOLTAGE CALIBRATION:

An adjustable and regulated line frequency calibration signal is provided on the last position of the vertical attenuator switch for use in calibrating the vertical amplifier.

1.8 ADDITIONAL FEATURES:

- (a) Direct connection to deflection plates available.
- (b) Shock mounted amplifiers.

9 TUBE COMPLEMENT:

<u>Ref. Symbol</u>	<u>Type</u>	<u>Function</u>
V101A	6BA8A Pent. Sect.	Vertical Input Amplifier (Active)
V101B	6BA8A Triode Sect.	Vertical Final (Active)
V102A	6BA8A Pent. Sect.	Vertical Input Amplifier (Inactive)
V102B	6BA8A Triode Sect.	Vertical Final (Inactive)
V103A	6BA8A Pent. Sect.	Horiz. Input Amp. (Active)
V103B	6BA8A Triode Sect.	Horiz. Final Amp. (Active)
V104A	6BA8A Pent. Sect.	Horiz. Input Amp. (Inactive)
V104B	6BA8A Triode Sect.	Horizontal Final (Inactive)
V201A	6AW8 Triode Sect.	Sweep Circuit Oscillator Stability Amp.
V201B	6AW8 Pentode Sect.	Blanking Amp.
V202A	6BA8A Triode Sect.	Sweep Circuit Discharge Tube
V202B	6BA8A Pent. Sect.	Sweep Circuit Oscillator Multivibrator
V203A & B	12AU7 Duo Triode	Sync. Amp. Phase Inverter
V301	6X5GT/G	Low Voltage Rect.
V302	OA2	150 Volt Reg.
N301	NE-32	60 Volt Regulator
CRT 301	3RP1	Cathode Ray Tube

SECTION II

OPERATION

2.1 GENERAL

If this instrument is connected to the proper power source, as outlined in the Technical Data Sheet and if no other connections are made to the instrument, it is impossible to damage it with any settings of the panel controls.

In the case of an instrument where input terminals are involved, such as an oscilloscope, reference should be made to the Technical Data sheet for maximum input voltages that can be applied to the input terminals.

In the case of an instrument where output terminals are involved, such as a signal generator, care should be taken not to apply external voltages to the output terminals as this might result in damage to the internal circuits.

CAUTION

CARE SHOULD BE TAKEN WHEN OPERATING THIS INSTRUMENT WITH THE CASE REMOVED AS THERE ARE HIGH AND DANGEROUS VOLTAGES PRESENT. IN THE CASE OF OSCILLOSCOPES, CARE SHOULD BE TAKEN IN HANDLING CATHODE RAY TUBE, AS FRACTURING OR SHATTERING OF THIS TUBE COULD BE DANGEROUS TO THE OPERATOR.

2.2 CONTROLS AND THEIR FUNCTIONS

(a) CATHODE RAY TUBE CONTROLS

1. INTENSITY: A control of the intensity of the cathode ray beam.
2. FOCUS: A control of the focusing of the cathode ray beam to produce a finely defined pattern.
3. ASTIG: A control of the astigmatism voltage on the gun to further improve the definition of the pattern.

NOTE: Set the FOCUS and INTENSITY controls for the smallest spot with the minimum readable brilliance in order to preserve the life of the tube. Do not leave a spot or trace in one place for a very long period of time as it may burn that part of the screen. When the trace is not being observed the INTENSITY control should be adjusted until the spot or trace disappears.

(b) VERTICAL CONTROLS

1. VERTICAL ATTENUATOR: A coarse control of the vertical input voltages to the vertical amplifier. The first four positions divide the input voltage by factors of 1, 10, 100 and 1000 respectively. On the fifth position, marked CAL, an adjustable regulated line frequency signal is injected for use in calibrating the vertical amplifier.
2. VERTICAL GAIN: A vernier control of the sensitivity of the vertical amplifier. This control is so designed as to reduce the sensitivity by a factor of ten and thus will never reduce the deflection to absolute zero.
3. VERTICAL D. C. BALANCE: A control to eliminate the vertical shift in positioning with the gain control setting. This is a screwdriver adjustment located above the vertical gain control on the front panel. To adjust, set the vertical gain control at maximum and position the beam to the center of the screen with the vertical positioning control. Next, readjust the vertical gain control to minimum and re-center the beam vertically with the D. C. balance control. When adjusted properly, there should be no D. C. shift in positioning, as the vertical gain control is adjusted.
4. VERT. POS., DOWN-UP: A control of the vertical position of the cathode ray pattern. Be sure that the beam has been properly centered before trying to interpret patterns.

NOTE: Always use the maximum vertical attenuator setting which will give satisfactory display.

(c) HORIZONTAL CONTROLS

1. HORIZONTAL ATTENUATOR: A coarse control of the horizontal input volt-

ages to the horizontal amplifier. The first four positions divide the input voltage by factors of 1, 10, 100, and 1000 respectively. On the fifth position, marked CAL. an adjustable regulated line frequency signal is injected for use in calibrating the horizontal amplifier.

2. HORIZONTAL GAIN: A vernier control of the sensitivity of the horizontal amplifier. This control is so designed as to reduce the sensitivity by a factor of ten and thus will never reduce the deflection to absolute zero.
3. HORIZONTAL D.C. BALANCE: A control to eliminate the horizontal shift in positioning with the gain control setting. This is a screwdriver adjustment located above the horizontal gain control on the front panel. To adjust, set the horizontal gain control at maximum and position the beam to the center of the screen with the horizontal positioning control. Next, readjust the horizontal gain control to minimum and re-center the beam horizontally with the D.C. balance control. When adjusted properly, there should be no D.C. shift in positioning, as the horizontal gain control is adjusted.
4. HOR. POS. DOWN-UP: A control of the horizontal position of the cathode ray pattern. Be sure that the beam has been properly centered before trying to interpret patterns.

NOTE: Always use the maximum horizontal attenuator setting which will give satisfactory display.

(d) SWEEP CIRCUIT CONTROLS

1. COARSE FREQUENCY: A control providing 5 ranges of sweep frequency 1 to 10 cycles, 10 to 100 cycles, 100 to 1000 cycles, 1000 to 10,000 cycles, and 10,000 cycles to 100,000 cycles respectively. The first position of this switch marked EXT CAP. makes available lower sweep frequencies with the use of an external capacitor between the external capacity and ground binding post right next to this control.

NOTE: A good quality paper condenser should be used to assure a linear stable sweep positioning.

2. VERNIER FREQUENCY: A vernier control of the frequency of the sawtooth sweep within the range covered by any one position of the sweep range control. This control is calibrated to approximately 20% and thus the frequency can be read directly off the panel with the application of the proper multiplication factor in accordance with the setting on the sweep range control.
3. SWEEP POSITIONING: A control of the horizontal position of the cathode ray pattern operable only when using the sweep as the horizontal time base. This control is so designed that when operating the horizontal gain control the expansion of the pattern occurs around the center line of the cathode ray tube. When the pattern has been locked in at minimum horizontal gain the portion of the pattern of interest can be positioned horizontally until it appears under the center line of the cathode ray tube. When the trace is expanded by use of the horizontal gain control whatever portion of the pattern

that was positioned under the center line of the cathode ray tube will remain stationary.

4. SWEEP STABILITY: A control of the mode of the sweep circuit oscillator from driven sweep at one end of the control to recurrence sweep at the other end. When operating the sweep circuit oscillator in a recurrent mode, the stability control should be positioned completely counter-clockwise to the recurrent end of the control to set the sweep circuit oscillator in a driven mode, remove all locking signals, rotate the vernier frequency control to 10 and adjust the stability control by turning clockwise until the sweep stops at the right hand side of its trace. The sweep will then be adjusted to a driven mode.

(e) SYNC CONTROLS

1. HORIZONTAL FUNCTION SWITCH: A control of the function of the horizontal amplifier and synchronization. The first position marked AMP operates the horizontal amplifier as a twin to the vertical amplifier providing two identical amplifier channels. The second position marked INT. SYNC operates the horizontal amplifier in conjunction with the sweep circuit oscillator and further controls the locking of the sweep circuit oscillator from signal drive from the vertical amplifier. The third position marked EXT. SYNC. operates the horizontal amplifier in conjunction with the sweep circuit oscillator, but further provides locking for the sweep circuit oscillator from the external sync binding posts.
2. LOCKING: A variable control of the amount of locking voltage fed to the sweep circuit oscillator.

NOTE: To prevent distortion use as little locking voltage as possible to cause the image to remain stationary.

(f) MISCELLANEOUS CONTROLS

1. CAL. VOLT. VERNIER: A control of the regulated calibration voltage available to each amplifier. This voltage can be monitored from a binding post by a high impedance voltmeter. This voltage is made adjustable for use of the oscilloscope in special purpose applications.

2.3 TERMINALS

(a) VERTICAL AMPLIFIER:

1. AC: A binding post for capacitive coupling an input signal to the vertical amplifier.
2. GND: A binding post connected directly to the chassis of the instrument.
3. DC: A binding post for directly connecting an input signal to the vertical amplifier.

(b) HORIZONTAL AMPLIFIER:

1. AC: A binding post for capacitive coupling an input signal to the horizontal amplifier.
2. GND: A binding post connected directly to the chassis of the instrument.
3. DC: A binding post for directly connecting an input signal to the horizontal amplifier.

(c) SWEEP

1. Z AXIS: A binding post for capacitive coupling and external signal to the control grid of the cathode ray tube to allow intensity modulation of the cathode ray tube beam.
2. GND: A binding post connected directly to the chassis of the instrument.
3. EXT. CAP: A binding post for use in conjunction with the external capacity position of the coarse frequency switch to allow the use of external capacitors for very low writing speeds.

(d) SYNC

1. CAL. VOLT. MONITOR: A binding post for use in monitoring the adjustment of the Cal. Volt. vernier for its use in regard to the calibration of the horizontal and vertical amplifier.
2. GND: A binding post connected directly to the chassis of the instrument.
3. EXT. SYNC: A binding post for use in capacitive coupling an external synchronization signal with the sweep circuit oscillator.

SECTION III

MAINTENANCE

3.1 GENERAL

CAUTION

CARE SHOULD BE TAKEN WHEN OPERATING THIS INSTRUMENT WITH THE CASE REMOVED AS THERE ARE HIGH AND DANGEROUS VOLTAGES PRESENT. IN THE CASE OF OSCILLOSCOPES, CARE SHOULD BE TAKEN IN HANDLING CATHODE RAY TUBE, AS FRACTURING OR SHATTERING OF THIS TUBE COULD BE DANGEROUS TO THE OPERATOR.

As this Hickok instrument has been built under the high standards and quality of materials which has made Hickok famous, no maintenance other than routine replacement of tubes should be necessary. It is suggested that, should the instrument need maintenance

other than routine replacements, the factory be contacted in accordance with "Returning Equipment for Repair".

All vacuum tubes are operated at, or below, their normal ratings to insure long life and uniform service. All tubes are easily accessible after the cover has been removed from the case.

This instrument is protected with fuses as indicated on the schematic and in the parts list. In order to afford proper protection for this instrument, no other fuses should be used except those indicated.

The cathode ray tube requires care in use and care in handling. Care should always be taken that the beam is not left in one spot for long periods of time as the screen may become burned or streaked. Adjust the beam for minimum readable brilliance and smallest spot to increase tube life.

CAUTION

HANDLE WITH CARE. Breakage of this tube, which contains a high vacuum, may result in injury from flying glass. Do not strike or scratch the tube. Never subject to more than moderate pressure when installing in or removing from equipment.

To remove the cathode ray tube, remove the socket, and slide the tube forward.

3.2 ADJUSTMENTS

None of the following adjustments should be attempted until this instrument has been operating a sufficient length of time to assure that it is at its normal operating temperature. These adjustments should be made with a line voltage of 115 volts.

(a) CALIBRATION CONTROLS - VERTICAL AND HORIZONTAL AMPLIFIER:

1. VERT. CENT. CAL., P118 & HOR. CENT. CAL., P119: Set Horizontal function selector switch to AMP. position. Set horizontal and vertical gain controls to maximum (100). Set horizontal and vertical attenuator switches to X1K position. Set horizontal and vertical positioning controls to their approximate mechanical center. Adjust VERT. CENT. CAL. control P118 (See fig. 3.1) for zero voltage between the vertical deflection plates. Adjust HOR. CENT. CAL. control P119 (See fig. 3.1) for zero volts across the horizontal deflection plates.
2. HORIZONTAL AND VERTICAL DEFLECTION PLATE BALANCE ADJUST: P141: With the front panel controls set as above in section 1, adjust P141 (See fig. 3.1) until the vertical deflection plate voltages equal the horizontal deflection plate voltages as measured from ground.
3. AMP. BIAS (P301): With the front panel control set as in section 1 above, adjust AMP bias P301 (See fig. 3.1) until the vertical and horizontal deflection plate voltages are 200 volts as measured from ground.

4. AMP. SCREEN ADJ. P305: With the front panel control set as above in section 1 adjust amp. screen adjust P305 (See fig. 3. 1) until the screen voltages on the pentode sections of V101A and V103A are 72 volts (this voltage can be measured at the entrance of the white and purple wire on the dual amplifier board).

NOTE: It may be found necessary to repeat the above procedure so that all the adjustments may be satisfied simultaneously.

5. HORIZONTAL AND VERTICAL DC BAL. ADJUSTMENTS P111 & P134: Adjust the horizontal and vertical gain controls to minimum (0) and recenter the beam on the cathode ray tube by adjusting front panel controls P111 and P134 marked vertical and horizontal DC BAL control.

(b) CALIBRATION CONTROLS - SWEEP CIRCUIT OSCILLATOR.

1. LO-FREQ. SWEEP CAL. P201: Set vertical attenuator switch on CAL position. Set vertical gain control for a convenient vertical trace; set horizontal function switch to EXT. SYNC. position, set horizontal gain control to minimum (0) set stability control to RE and center the trace horizontally with the sweep positioning control; set coarse frequency switch on X10, set vernier frequency control on 1; adjust LO-FREQ. SWEEP CAL. , P201 (See fig. 3. 1) so that a trace of 6 recurring wave shapes appear on the face of the cathode ray tube.
2. HI-FREQ. SWEEP CAL. P207: Set the front panel controls as in Section 1 above with the exception of vernier frequency control which should be set on the face of the cathode ray tube.

NOTE: The above two procedures may have to be repeated in order to provide simultaneous calibration at both ends of the frequency vernier control.

3. SWEEP CENT. CAL. , P139: Set the front panel controls as in section 1 above with the exception as follows: Set the horizontal function selection switch on INT SYNC. Set the locking control to provide sufficient locking to stop the trace movement; rotate the horizontal gain control to maximum (100) position the trace horizontally with the sweep positioning control to align some recognizable portion of the pattern underneath the horizontal center line. Reduce the horizontal gain control to minimum (0) and adjust SWEEP CENT. CAL P139 (See fig. 3. 1) until the same portion of the trace again appears under the horizontal center line.

NOTE: The sweep should now expand around the horizontal center line of the cathode ray tube. This adjustment should not be made unless the horizontal amplifier has been adjusted for DC balance as in section A5 above.

(c) AMPLIFIER FREQUENCY COMPENSATION PROCEDURE:

1. Apply a source of 50 KC square wave to the input terminals.
2. With attenuator on X1, gain control at maximum, adjust C110 and C111

(for vertical) or C121 and C122 (for horizontal) for proper square wave form.

3. With attenuator on X1, gain control at minimum, adjust C109 (for vertical) or C120 (for horizontal) for proper square wave form.
4. Change the square wave frequency at the input terminals to 1KC.
5. With attenuator set on X10, gain control at minimum adjust C102 (for vertical) or C114 (for horizontal) for proper square wave form.
6. With the attenuator set on X10 gain control at maximum, adjust C124 (for vertical) or C125 (for horizontal) for proper square wave form.
7. With attenuator set at X100, gain control at maximum, adjust C102 (for vertical) or C116 (for horizontal) for proper square wave form.
8. Set attenuator on X1000, gain control at maximum, adjust C106 (for vertical) or C118 (for horizontal) for proper square wave form.

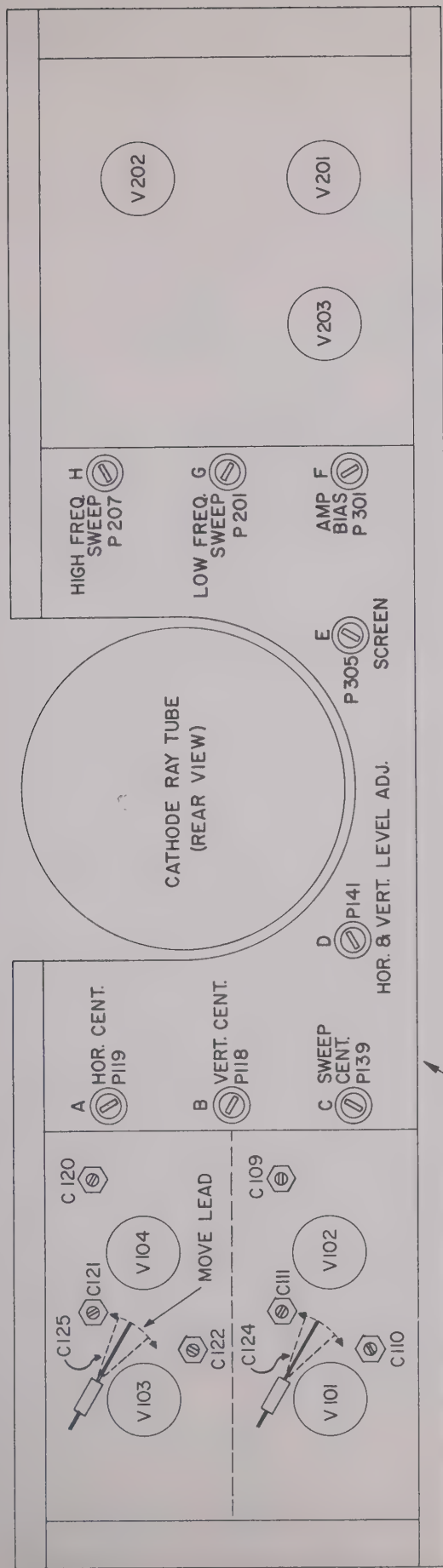


FIG. 3.1

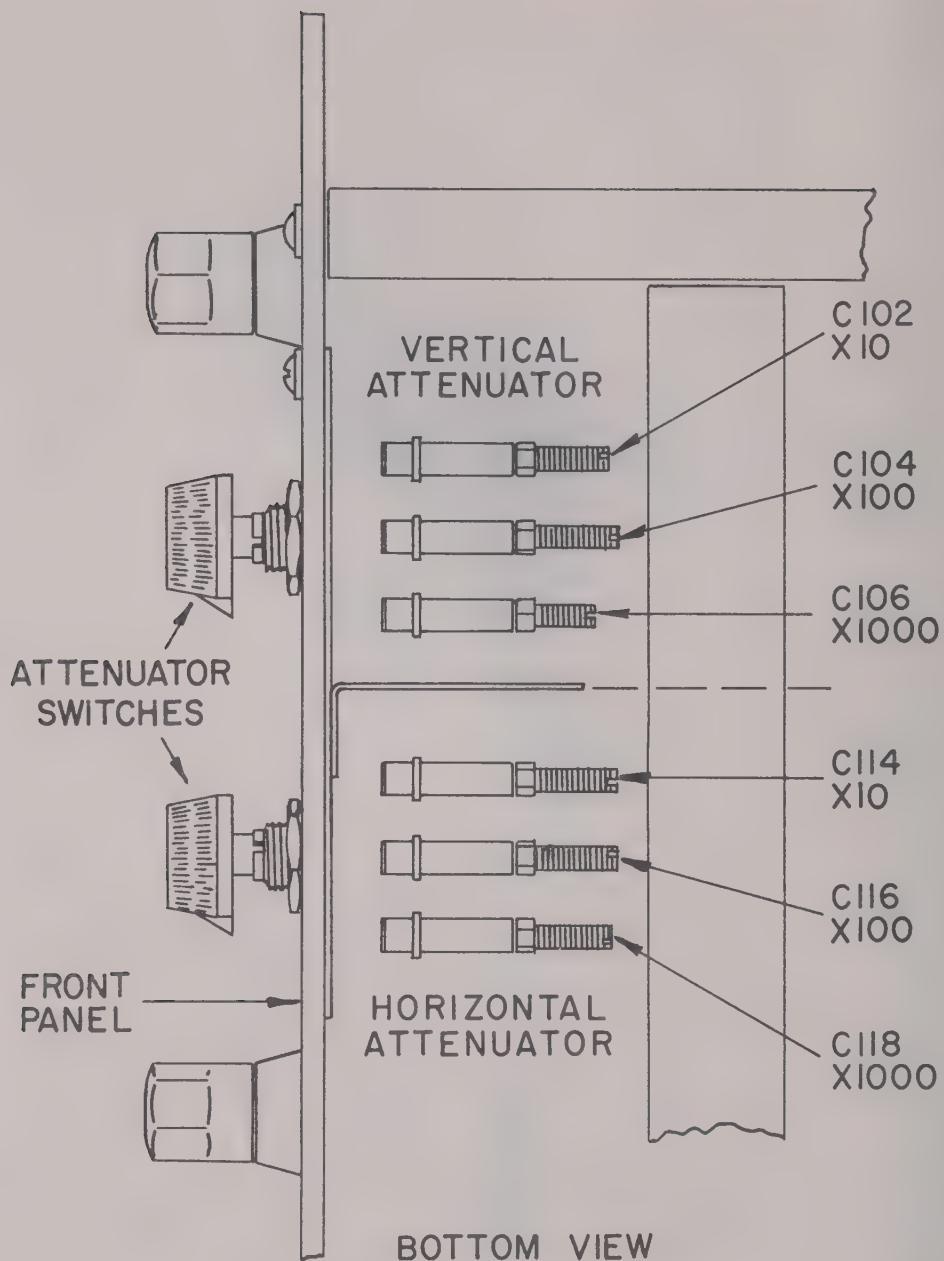


FIG. 3.2

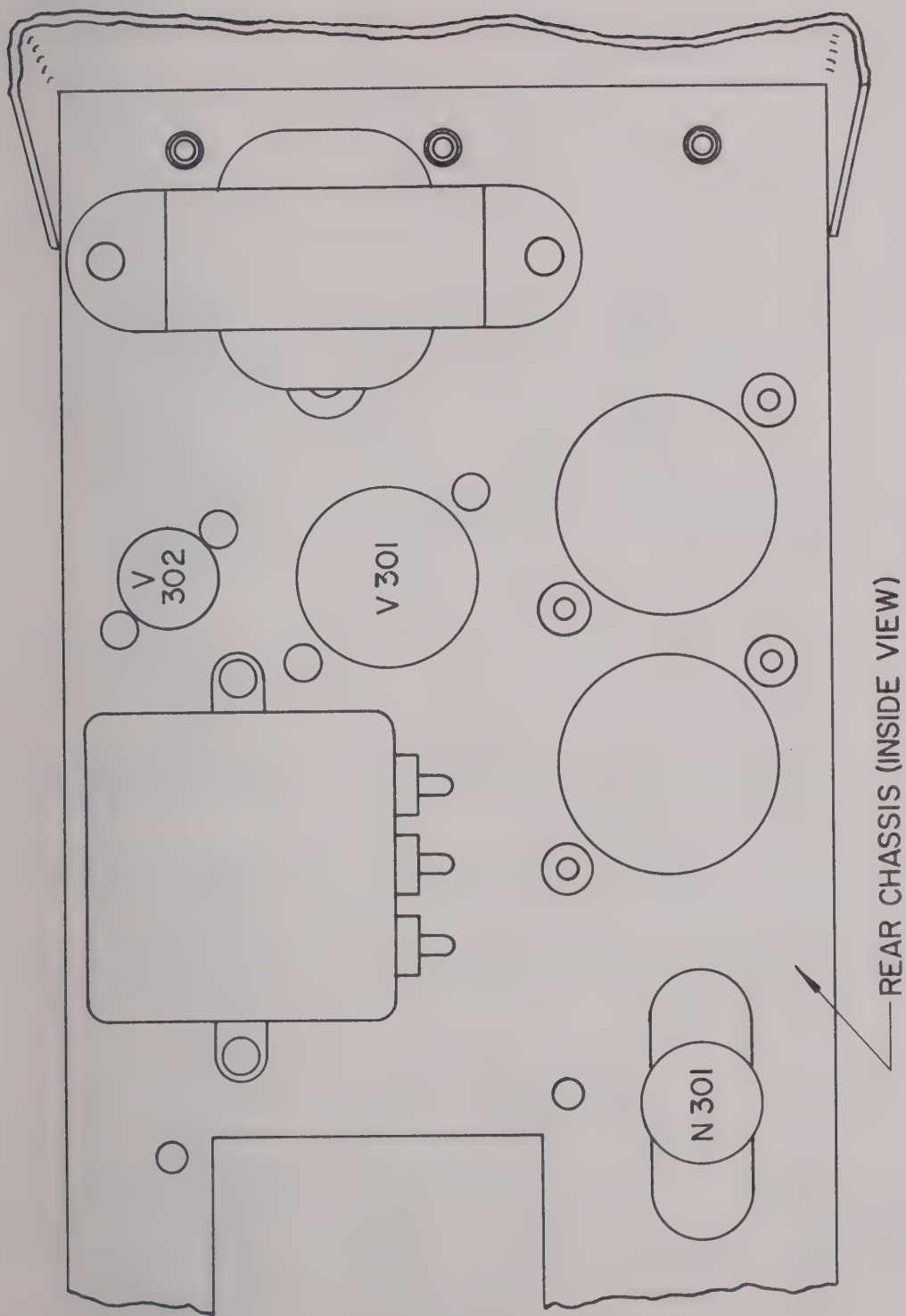
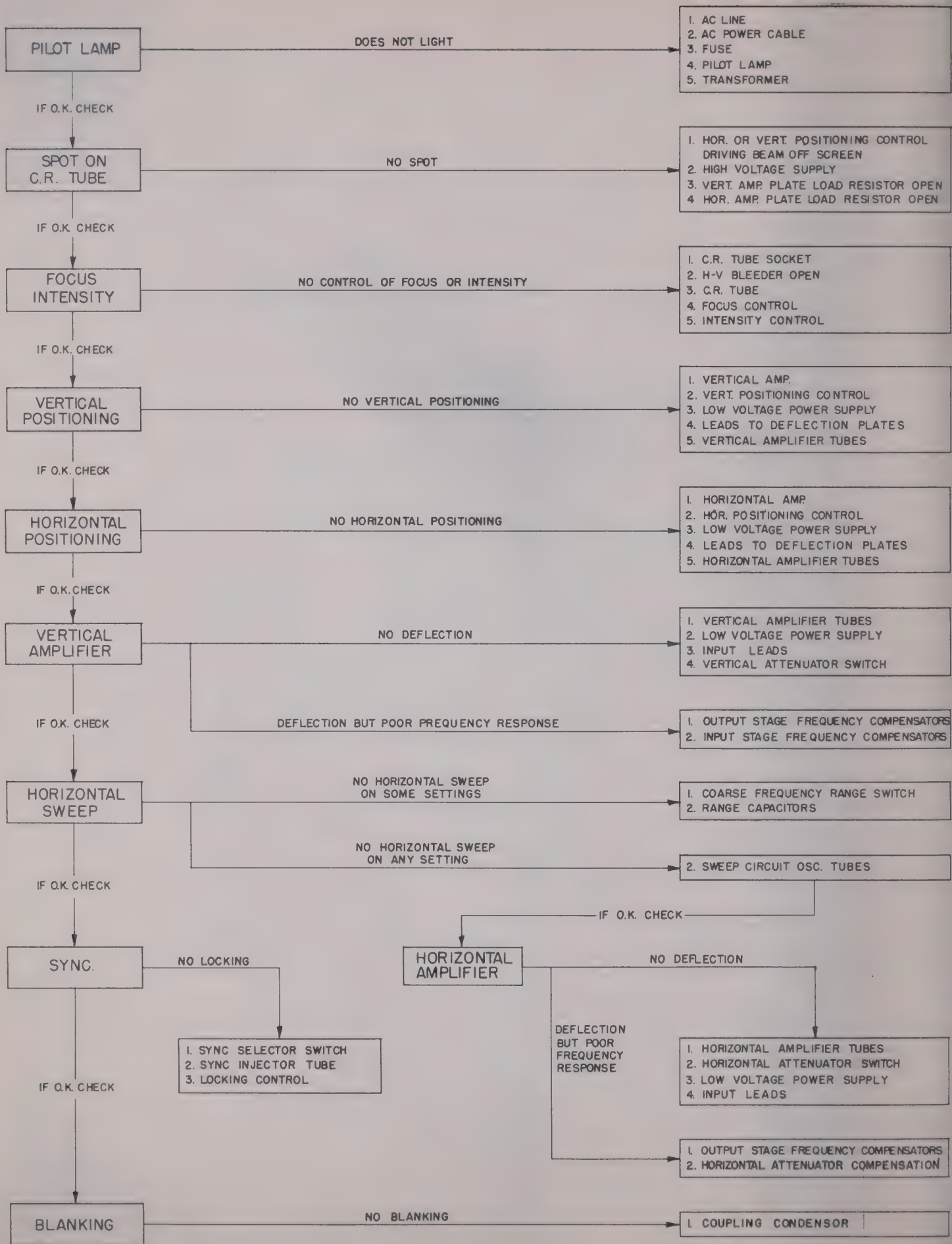
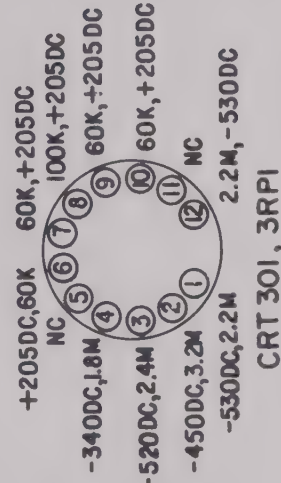
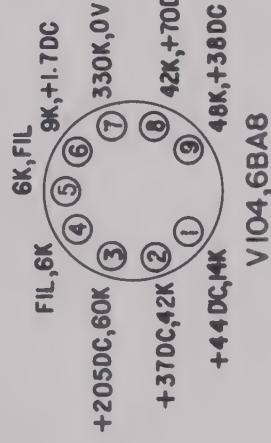
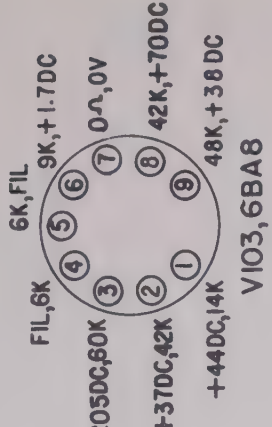
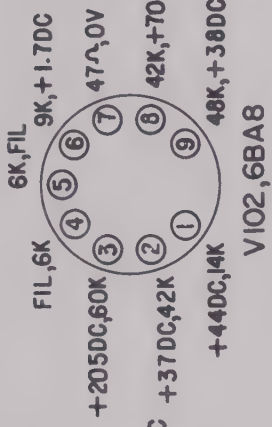
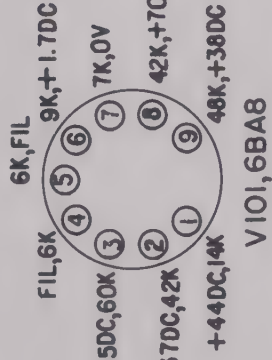
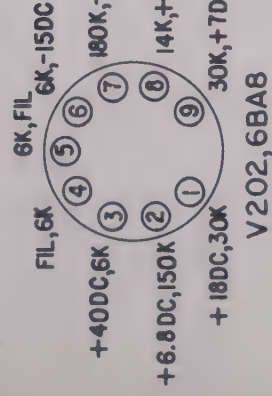
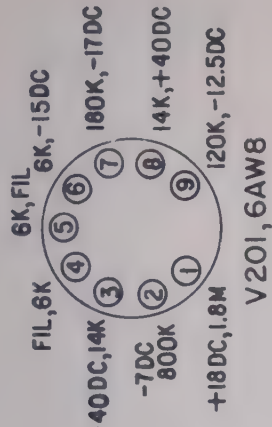
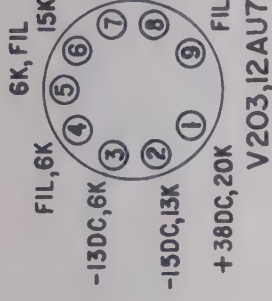
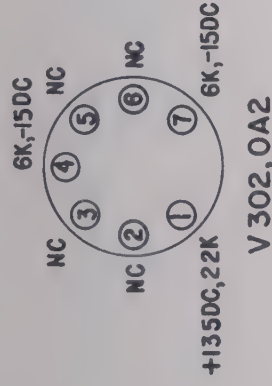
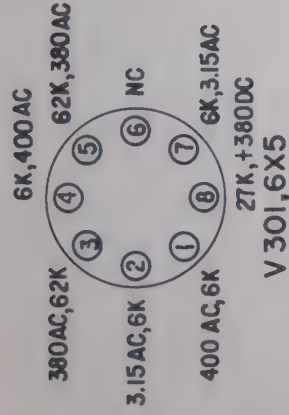


FIG. 3.3



MODEL 387R OSCILLOSCOPE



HICKOK ELECTRICAL INSTR. CO.
CLEVELAND 8, OHIO

ALL MEASUREMENTS: (WITH 209A - GROUND AS REFERENCE)	HORIZONTAL GAIN MINIMUM
LINE -115 V.A.C., 80 WATTS	
CRT BEAM CENTERED	
VERTICAL GAIN AT MAXIMUM	
VERTICAL ATTENUATOR - CAL.	
HORIZONTAL SELECTOR - INT. SYNC.	
STABILITY - RECURRENT	

NOTES

NOTES



SCHEMATIC-HORIZONTAL & VERTICAL AMPLIFIERS

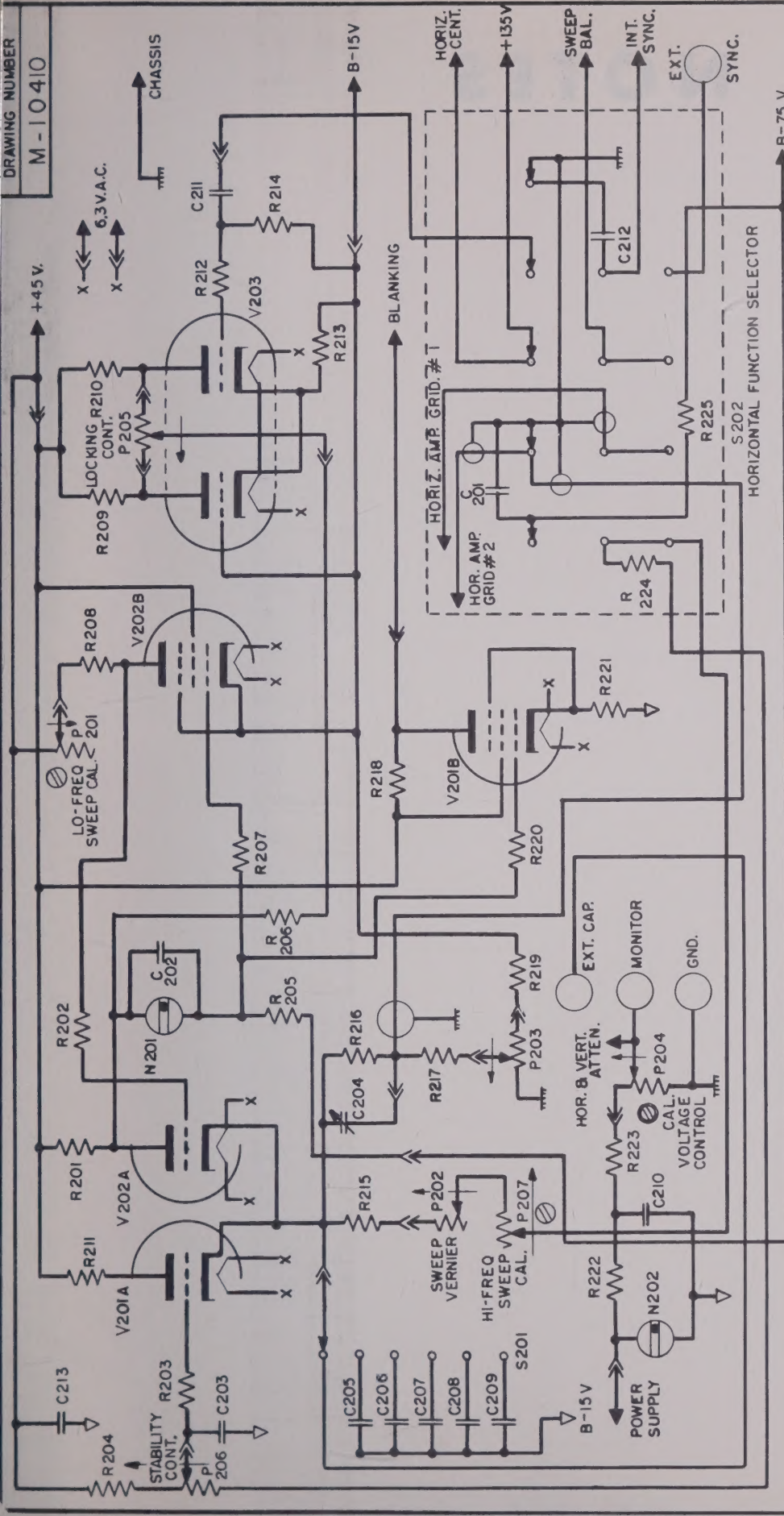
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DRAWN (CHECKED)	APPROVED	DRAWING NUMBER

DRAWN	CHECKED	APPROVED	DRAWING NUMBER
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M - 10310

CODE NO.	DESCRIPTION	TITLE	
13620-31	MODULE	C108	C101-113
3110-7	500V DISC.	C109-110-111	C102-104
3115-17	1.5-10 μ UF TRIMMER	C120-121-122	C106-114
3110-35	2 μ UF 600V	C123	C116-118
18410-472	47 1/2W 10%	R109-110-113	C103-115
18415-222	22MEG. 1/2W 10%	R121	C105-117
18412-222	2.2K 1/2W 10%	R132-136	C107-119
18432-751	75 K 2W 5%	R112-113	R107-130
18413-152	18K 1W 10%	R131-135	R105-128
18413-102	10K 1W 10%	R132-142	R103-126
18433-392	39K 2W 10%	R115-137	R102-125
		R117-140	R104-127
		R122-123	R101-106
		R144-145	R124-129
20875-135	68A8	V101-102	R108-131
19350-226	9 PIN PRINT. CIRCUIT ACCESSORIES	Y103-104	P141
16925-245	15K 1/2W 10% LIN.	SOCKETS (4)	P116
3110-7	500V DISC.	P118-119	P114-143
		C124	P111-134
			P138
			P139
			P101-102

NOTES



RECEPTACLE		ADJUSTABLE SCREW DRIVER POT.		ADJ. SC'W DR'R. POT (APPEARS ON PANEL)	
CODE NO.	DESCRIPTION	TITLE			
13620-41	MODULE	18414-272	270 K 1/2W 10%	R217	16925-281
3100-7	.005 U.F. 500V	18416-201	20 MEG. 1/2 W 10%	R222	16925-284
3100-12	1000 U.F. CERAMIC	C202-203-213	.22 MEG. 1/2 W 10%	R214-215-223	19912-321
3115-17	1.5-10 U.F. TRIMMER	C210	10 MEG. 1/2 W 10%	R216	19912-322
3110-69	.1 U.F. 500V DISC CER.	C204	NE-2	NEON N201-202	20875-138
		C211	ACCESSORIES		20875-69
18410-152	15 1/2W 10%	R212-220	68 U.F. 200V MICA	C209	20875-137
		R203-207-211	.005 U.F. 500V	C201-212	16925-291
18412-562	56K 1/2W 10%	R210-206	1 U.F. 200V	C205	16925-245
18412-822	1K 1/2W 10%	R201	.1 U.F. 200V	C205	250K 1/2W
18412-822	47 1/2W 10%	R209	.01 U.F. 200V	C207	P207
18410-472	47 1/2W 10%	R221-202	1000 U.F. 500V MICA	C208	
18414-332	330K 1/2W 10%	R205	820K 1/2W 10%	R224	
18412-562	56K 1/2W 10%	R208	33K 1/2W 10%	R225	
18412-682	6.8K 1/2W 10%	R213	270K 1/2 W 10%	R204	
18413-682	68K 1/2 W 10%	R219		P201	
18414-102	100K 1/2W 10%	R218		P203	
				P205	

DATE 2-3-56
DRAWING NUMBER
M-10410

HICKOK ELECTRICAL INSTRUMENT CO.
CLEVELAND, OHIO

SCHEMATIC - SWEEP

USED ON MODEL 387R
DRAWN [CHECKED] APPROVED
LCH

NOTES

Hickok



**ELECTRICAL
INSTRUMENT
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10514 DUPONT AVE., CLEVELAND 8, OHIO